

WHAT IS CLAIMED IS:

1. A suture anchor for disposition in a bore in a bone, the anchor comprising:

a substantially wedge-shaped body having a smaller distal end and a larger proximal end, means thereon for retaining a suture, and means thereon for releasable connection to an inserter shaft;

a boundary surface and a plow surface of said body intersecting to form a biting edge at said proximal end of said body; and

said boundary surface and an abutment surface of said body intersecting to form a cam surface at said proximal end of said body; and

said biting edge being adapted to be in engagement with a first wall portion of the bore and said cam surface being adapted to be in engagement with a second wall portion of the bore opposed to the first wall portion;

wherein tension on said inserter shaft is operable to move said cam portion along said bore second wall portion and rotate said body in said bore such that said biting edge bites into said bore first wall portion to lock said body in said bore.

2. The suture anchor in accordance with claim 1 wherein said plow surface comprises a first edge wall portion of said body and said abutment surface comprises a second edge wall portion of said body.

3. The suture anchor in accordance with claim 2 wherein said plow surface and said abutment surface intersect to form said distal end of said body.

4. The suture anchor in accordance with claim 3 wherein said distal end of said body is rounded in side elevation, said cam surface is rounded in side elevation, and said plow surface and said abutment surface are rounded in plan view, whereby to guide entry of said body into the bore in the bone.

5. The suture anchor in accordance with claim 3 wherein said body is provided with first and second opposite and parallel planar sides, said body defines a hole therethrough for retaining a suture, said hole extending from said first side to said second side, and each of said sides is provided with a rounded entryway leading to said hole, such that said hole is devoid of edges against which the suture can impinge.

6. The suture anchor in accordance with claim 3 wherein said body defines a hole therethrough for retaining a suture, said hole being substantially elliptical in width-wise cross-section and having a major axis substantially normal to a minor axis, said major axis being aligned with a selected region of said body to direct stress from the suture toward said selected region of said body.

7. The suture anchor in accordance with claim 3 wherein said body defines a hole therethrough for retaining a suture, said body having first and second sides, said hole extending from said first side to said second side, each of said sides being provided with a pathway extending from said hole to said boundary surface, said pathway extending into the side of said body further than the diameter of the suture, such that the suture in said hole extends through said pathways and is disposed in said pathways removed from outer surfaces of said body first and second sides.

8. The suture anchor in accordance with claim 3 wherein said means for releasable connection to an inserter shaft comprises a smooth-walled counterbore in said boundary surface, and a second bore in a bottom of said counterbore, said second bore being adapted to receive a threaded end portion of the inserter shaft and to be threadedly engaged thereby, and said counterbore being adapted to receive a cylindrically-shaped flexible tip portion of said inserter shaft, wherein flexing of said inserter shaft tip portion is permitted by said counterbore substantially without disturbing the engagement of said threaded end portion of said inserter shaft with said second bore.

9. A suture anchor for disposition in a bore in a bone, the anchor comprising:

a substantially wedge-shaped body having a smaller distal end and a larger proximal end, said body defining a hole therethrough for retaining a suture, and said body having means thereon for releasable connection to an inserter shaft;

said body having first and second opposite and parallel planar sides;

said hole extending from said first side to said second side;

each of said sides being provided with a rounded entryway leading to said hole, such that said hole is devoid of edges against which the suture can impinge.

10. A suture anchor for disposition in a bore in a bone, the anchor comprising:

a substantially wedge-shaped body having a smaller distal end and larger proximal end, means thereon for retaining a suture, and means thereon for releasable connection to an inserter shaft;

said body distal end being of rounded configuration;

a plow surface of said body being of rounded configuration in plan view;

an abutment surface of said body opposite from said plow surface being of rounded configuration in plan view; and

said abutment surface and a boundary surface of said body intersecting to form, in side elevational view, a rounded configuration;

said rounded configurations being operable to guide entry of said body into the bore in the bone and to center said body in the bore.

11. A suture anchor for disposition in a bore in a bone, the anchor comprising:

a substantially wedge-shaped body having a smaller distal end and a larger proximal end, said body defining a hole therethrough for retaining a suture, and said body having means thereon for releasable connection to an inserter shaft;

said hole being substantially elliptical in width-wise cross-section and having a major axis substantially normal to a minor axis;

said major axis being aligned with a selected region of said body to direct stress from the suture toward said selected region of said body.

12. A suture anchor for disposition in a bore in a bone, the anchor comprising:

a substantially wedge-shaped body having a smaller distal end and a larger proximal end, said body defining a hole therethrough for retaining a suture, and said body having means thereon for releasable connection to an inserter shaft;

~~said body having first and second opposite sides;~~

said hole extending from said first side to said second side;

each of said sides being provided with a pathway extending from said hole to a boundary surface of said body, said pathway extending into the side of said body further than the diameter of the suture, such that the suture in said hole extends through said pathways and is disposed in said pathways removed from outer surfaces of said body first and second sides.

13. A suture anchor according to claim 12 wherein walls of said pathways diverge as said walls extend proximally.

14. A suture anchor for disposition in a bore in a bone, the anchor comprising:

a substantially wedge-shaped body having a smaller distal end and a larger proximal end, said body having means thereon for retaining a suture, and a boundary surface having means therein for releasable connection to an inserter shaft;

said means for releasable connection to an inserter shaft comprising a smooth-walled counterbore in said boundary surface, and a second bore in a bottom of said counterbore, said second bore being adapted to receive a threaded end portion of the

insertor shaft and to be threadedly engaged thereby, and said counterbore being adapted to receive a cylindrically-shaped flexible tip portion of said insertor shaft;

wherein flexing of said insertor shaft tip portion is permitted by said counterbore substantially without disturbing the engagement of said threaded end portion of said insertor shaft with said second bore.

15. An installation tool for placing a suture anchor and a suture attached thereto in a bore in a bone, the tool comprising:

an elongated shroud having therein an internal opening;

an insertor shaft slidably disposed in said internal opening;

~~the suture anchor being releasably connected to a distal end of said insertor~~
shaft;

said shroud being of elastomeric material and configured to form first and second channels on opposite sides of said internal opening and adapted each to retain a portion of the suture attached to said anchor and extending proximally therefrom;

each of said channels being formed such that a first portion of said channel at an outer surface of said shroud is narrower than a second portion of said channel spaced from said shroud outer surface;

said suture portions being removable from said channel second portions by passing through said channel first portions, said elastomeric material deforming to allow said passage through said channel first portion.

16. The installation tool in accordance with claim 15, wherein said elastomeric shroud includes ridge portions on said outer surface of said shroud on opposite sides of said shroud and each equidistant from said channels, pressure on said ridge portions radially inwardly being operable to open said first portions of said channels to permit entry of the suture portions, respectively, into said channels in a radially inwardly direction.

17. The installation tool in accordance with claim 15, further comprising recesses formed in said outer surface of said shroud, each of said channels being in communication with one of said recesses, such that each suture portion retained by one of said channels extends into one of said recesses, and extends outwardly therefrom.

18. A bone anchor system comprising:
a suture anchor having means thereon for releasable connection to an installation tool; and
the installation tool for placing said suture anchor and a suture attached thereto in a bore in a bone, said installation tool comprising an elongated shroud having an internal opening, and an inserter shaft slidably disposed in said internal opening, said inserter shaft comprising a proximal rigid portion connected to a distal flexible portion, said distal flexible portion being adapted to releasably connect to said suture anchor.

19. A bone anchor system comprising:
a suture anchor comprising a substantially wedge-shaped body having a smaller distal end and a larger proximal end, means thereon for retaining a suture, and a boundary surface having means thereon for releasable connection to an inserter shaft;
a suture connected to said anchor by said suture retaining means; and
an inserter shaft connected to said anchor by said boundary surface inserter shaft connection means, said inserter shaft comprising an elongated rod having a handle at a proximal end thereof and said anchor disposed at a distal end thereof, said handle being generally of a "T" configuration in which the head of the "T" is angled 5° - 45° off normal to the axis of said rod, said handle being configured such that the head of the "T" fits a palm of an operator's hand and a portion of said head of the "T" extending outwardly and distally from said rod proximal end is adapted to receive a thumb of the hand of the operator.

20. The bone anchor system in accordance with claim 19 wherein

said anchor body is provided with side walls interconnecting edge walls and said boundary surface, said edge walls converging distally to form said anchor smaller end, said side walls extending in a plane widthwise of said rod; and

said handle is provided with side walls which extend in the same direction as said anchor body side walls, such that the direction of extent of said handle "T" head portion in plan view corresponds with the direction of extent of said widthwise plane in which is disposed said anchor, whereby

the operator can discern by the position of the "T" head portion of said handle the position of said anchor.

21. The bone anchor system in accordance with claim 20 wherein prior to deployment in the bore said smaller end of said anchor body is at a distal end of one of said body edges which is in alignment with said rod, and said portion of said head of the "T" extending distally extends outwardly from said rod in the same direction as said one of said body edges, whereby

the operator can discern by the position of said handle the position of said smaller end of said anchor.

22. A bone anchor system comprising:

a plurality of suture anchors, each comprising a substantially wedge-shaped body having a smaller distal end and a larger proximal end, means thereon for retaining a suture, and means thereon for releasable connection thereof to an inserter shaft;

an inserter shaft connected to each said anchor by said releasable connection means; and

a suture connected to each of said anchors by said suture retaining means, said sutures each being visually distinguishable from the remainder of said sutures, such that appropriate pairs of strands of said sutures may be visually identified by an operator.

23. The bone anchor system in accordance with claim 22 wherein said sutures are visually distinguishable by color.

24. A bone anchor system comprising:

a suture anchor comprising a substantially wedge-shaped body having a smaller distal end and a larger proximal end, means thereon for retaining a plurality of sutures, and means thereon for releasable connection thereof to an inserter shaft;

an inserter shaft connected to said anchor by said releasable connection means; and

a plurality of suture strands connected to said anchor by said suture retaining means, ~~said suture strands being visually distinguishable from each other, such that~~ appropriate pairs of strands of said sutures may be visually identified by an operator.

25. The bone anchor system in accordance with claim 24 wherein said suture strands are visually distinguishable by color.

26. A bone anchor system comprising:

a bone anchor having means thereon for retaining a suture; and

the suture retained by said bone anchor;

said suture being identifiable by color such that said suture can be distinguished from other sutures of other colors.

27. A method for disposing a suture anchor in a bore in a bone, comprising the steps of :

providing a suture anchor having thereon means for connecting a suture thereto, means for releasably connecting an inserter shaft thereto, a biting edge thereon, and a rounded cam surface on an opposite side of said anchor from said biting edge, said inserter connecting means being offset from a center of said anchor; and providing an inserter shaft comprising an elongated rod having a handle at a proximal end thereof and at a distal end thereof connected to said anchor by said releasable connecting

means; and connecting a suture to said anchor by way of said means for connecting a suture to said anchor;

by manipulation of said inserter shaft, inserting said anchor in said bone with said biting edge adjacent a first wall portion of the bore in the bone and said rounded cam surface adjacent an opposite second wall portion of the bore;

pulling said inserter shaft so as to cause said rounded cam portion to move along said second wall portion and said anchor to rotate in said bore with said anchor biting edge biting into said first wall portion of the bore, whereby to lock said anchor in said bore with said suture extending from said bore; and

disengaging said inserter shaft from said anchor.

28. The suture anchor in accordance with claim 1 wherein said connection means is offset from a center of said body and proximate said cam surface.